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COMPARISON OF EFFECTIVITY AND EXPENDITURE BETWEEN TRANS-CATHETER OCCLUSION OF PDA OR SURGICAL CLOSURE OF PDA

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Abstract:

Objectives: *This research work carried out to compare the effectivity and expense of the trans-catheter occlusion of PDA (Patent Ductus Arteriosus) with the surgical closure of PDA.*

Methodology: *This retrograde research work carried out in Cardiology Department of General Hospital, Lahore. Total two hundred and fifty pediatric patients who underwent PDA closure either trans-catheter or surgical way with the utilization of the SHSMA occlude present with greater than five kilogram weight from May 2016 to November 2019 were the participants of this research work. SPSS V.22 was in use for the statistical analysis of the collected information. We utilized the T-test for the comparison of the quantitative variables. We used the Chi square test for various qualitative variables. P value of less than 0.050 was significant statistically.*

Results: *There were total 120 patients underwent trans-catheter occlusion of patent ductus arteriosus with utilization of SHSMA Occluder forming PDA Device-Group and there were 130 patients who had to undergo surgical ligation of PDA making Surgical-Group. The prevalence of residual shunting was 1.50% (n: 2) in patients of surgical-group and no patient was present in PDA Device-group in the first thirty days of follow up. The rate of major complications was 3.10% (4) in surgical-group. There was high rate of transfusion of blood in the patients of surgical-group (P value = 0.040). There was less duration of hospital stay in PDA Device-group (P value of less than 0.0010). Total cost of the procedure in Pakistani rupees was 110695 ± 1054 in PDA Device-group and 92414 ± 3512 in the surgical-group (P value of less than 0.0010). The total expense of device closure of PDA was 16.520% greater than the PDA closure of surgical ligation. We found no surgical mortality.*

Conclusion: *The process of trans-catheter closure of patent ductus arteriosus is very effectual and less invasive in comparison with the surgical ligation closure. There is very low complication rate and the procedural expense in not much high in comparison with the surgical ligation of PDA.*

Key Words: *PDA, prevalence, mortality, ligation, expense, device group.*

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INTRODUCTION:

Ductus arteriosus is accountable for carrying 55.0% to 60.0% of fetal output in the duration of intra-uterine life cycle and it normally closed within twenty days of age after the birth [1]. The tenacity of the flow of blood from this channel after 2 to 3 weeks is an abnormality, which is accountable for 7.0% to 11.0% of congenital defects of cardiac functions [2, 3]. The rate of prevalence reaches to 80.0% in pre-mature babies with less than 1.2 kg body weight [1]. Early closure of PDA restricts the progression of complications as hypertension of pulmonary artery, cardiac failure and other infections [1-4]. Surgical PDA ligation was for the very first time stated in 1935 with outstanding outcomes through lateral thoracotomy [5]. From last twenty years, PDA closure with latest developed devices has been carried out with outstanding outcomes in different age groups [6]. Closure of PDA with utilization of ADO (Amplatzer Duct Occluder) has signified a better therapeutic option [7-10].

Expensive cost of this very device as compared to the surgical PDA ligation has restricted its widespread utilization. Surgical PDE ligation is very wide utilized method and it is in use in carious health care centers of our country Pakistan. Sun WF showed the outstanding results of closure of PDA with the utilization of SHSMA occlude [11]. The price of this very occluder is less in comparison with the ADO and other invented devices. There is no data available comparing the expenses and the effectivity of the SHSMA occluder with the surgical PDA ligation. So, this research work aimed to provide the comparison of difference in cost and effectivity of the trans-catheter closure of PDA with the utilization of SHSMA occluder versus surgical PDA ligation in our institute.

METHODOLOGY:

This retrograde research work carried out in Pediatric Department of General Hospital, Lahore. Data of total two hundred and fifty patients who underwent PDA closer by surgical or trans-catheter from May 2016 to November 2019 with a follow up period of 1 month was retrieved from data base of the department. Patients present with greater than 5 kg weight, having medium to large sized PDA were the participants of this research work. Patients without complete records or suffering from other serious complications were not the participants of this research work. The choice of the procedure was only on the preferences of the family of the patients or patients. We tool no consent from the patients because the nature of the study was retrospective. Ethical committee of the institute gave the permission to conduct this research work. Specialist performed the trans-catheter occlusion in the cardiac laboratory of catheterization of the institute under GA. The selected diameter of occlude was about 2 to 4 millimeter greater than the minimum size of duct. All the patients used the antibiotic prophylaxis. Surgeon performed the surgical ligation under GA in surgery room.

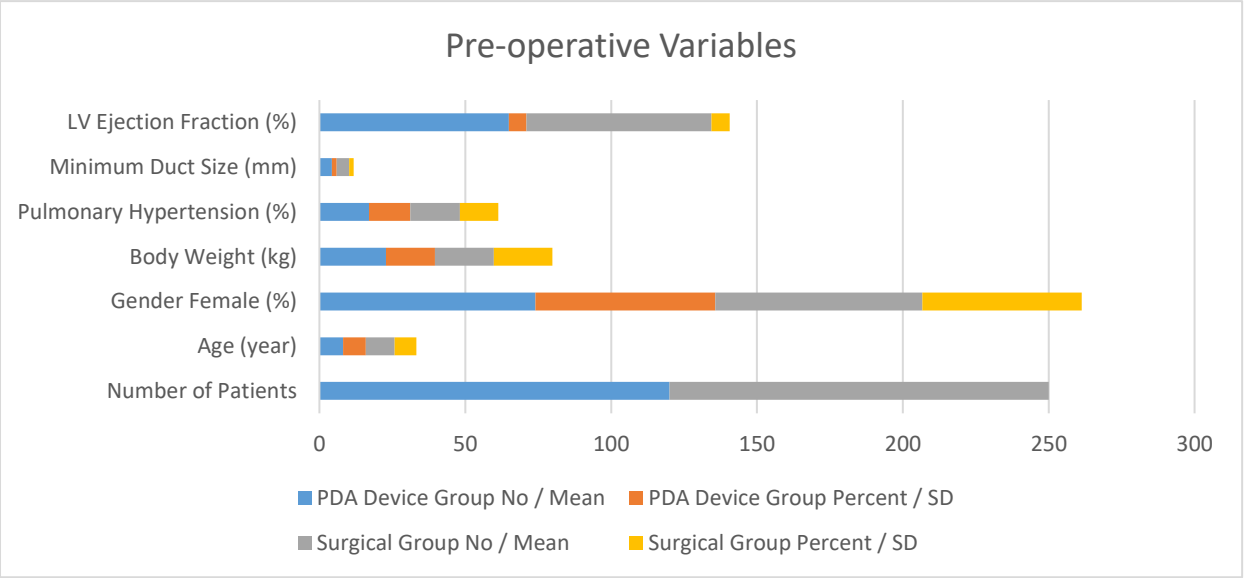
The adjustments of the doses of anesthesia carried out in accordance with response of the patients. Ligation was carried out by the triple ligation of PDA. All the patients underwent antibiotic treatment. We gathered the follow up data of complete one month after surgical intervention. We calculated total charges of the both procedures which included all the expenses from admission to the discharge from hospital. We did not included the expenses of follow ups. We used the SPSS V. 22 for the statistical analysis of the collected information. We used the T test for the comparison of the quantitative variables. We used the Chi-square test for the comparison of the qualitative variables. P-value of less than 0.050 was significant one.

RESULTS:

Total 120 patients underwent trans-catheter PDA closure with the utilization of SHSMA occluder formed the PDA Device-Group and 130 who had to undergo surgical PDA ligation formed the Surgical-Group. The patients of surgical group were elder in age as compared to the patients of the PDA device group. There was dominancy of female patients in this research work. There were total 61.70% females in the group of PDA Device and 54.60% females in the surgical group. There was no difference in the weight of body, minimum size of duct and pulmonary hypertension among the patients of both groups. The prevalence of residual shunting was 1.50% (n: 2) in surgical group and there was no incidence of residual shunting in group of PDA device at the period of follow up of one month. Only one patient in the group of PDA device underwent surgical closure of PDA because of device slip and exclusion of that very device carried out in the surgery room.

Table-I: Comparison of Pre-operative variables.

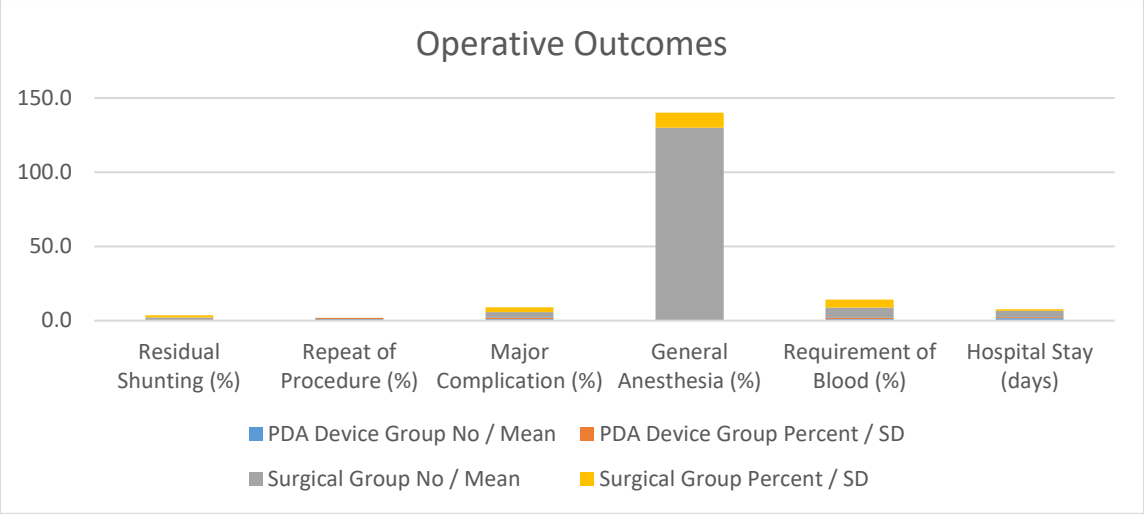
Variables	PDA Device Group		Surgical Group		P-value
	No / Mean	Percent / SD	No / Mean	Percent / SD	
Number of Patients	120	-	130	-	-
Age (year)	8.15	7.80	9.79	7.50	0.09
Gender Female (%)	74.0	61.70	71.0	54.60	0.26
Body Weight (kg)	22.86	16.73	20.16	20.13	0.25
Pulmonary Hypertension (%)	17.0	14.20	17.0	13.10	0.8
Minimum Duct Size (mm)	4.28	1.68	4.2	1.56	0.69
LV Ejection Fraction (%)	64.97	6.02	63.41	6.19	0.08



There were total 3.10% (n: 4) main complications in the surgical-group, 2 of which were tear of PDA in the procedure, which increases the duration of the method. There was need of GA (General Anesthesia) in all the patients of surgical group whereas no patients underwent GA in group of PDA device. More patients were available in the surgical group who were in need of transfusion of blood in the surgical intervention (P value 0.040). The duration of the hospital stay was much less in the group of PDA device, this duration was only 1.580 ± 0.690 days in the group of PDA Device versus 4.360 ± 1.170 days in the surgical group (P value less than 0.0010). Total cost of the procedure was 110000 rupees in group of PDA device and 93000 in the surgical group (P value less than 0.0010). There was no mortality in the duration of one month in every group.

Table-II: Comparison of operative outcomes.

Operative Outcomes	PDA Device Group		Surgical Group		P-value
	No / Mean	Percent / SD	No / Mean	Percent / SD	
Residual Shunting (%)	0.0	0.0	2.0	1.5	0.170
Repeat of Procedure (%)	1.0	0.8	0.0	0.0	0.330
Major Complication (%)	1.0	0.8	4.0	3.1	0.200
General Anesthesia (%)	0.0	0.0	130.0	10.0	<0.001
Requirement of Blood (%)	1.0	0.8	7.0	5.4	0.040
Hospital Stay (days)	1.58	0.69	4.36	1.17	<0.001
Total Cost (Rs.)	110695	1054	92414	3512	<0.001



DISCUSSION:

In time PDA closure leads to the patients towards normal life. For the very first time, Gross & Hubbard stated the procedure of surgical PDA ligation in 1938 after that it remained the ideal treatment method for many years [12]. Porstmann reported the PDA closure with the utilization of trans-catheter method for the very first time after that many devices were in use for the occlusion of the PDA [13, 14]. The PDA closure with SHSMA occluder was present with association with minimum number of complications in accordance with the findings of this research work. There was need of surgical intervention in only patient because of the device slip. There was no prevalence of residual shunting in one month follow up period. Prevalence rate of residual shunting was 1.50% in the surgical group of this research work. Many other research works stated that there is variation in the prevalence of residual shunting in surgical PDA closure from 1.50 to 23.0% [8, 14, and15).

The duration of stay in hospital was lea in the patients of PDA device group. Many other research works stated a small duration of hospital stay in the patients who underwent trans-catheter PDA closure. Jeong stated a long duration of hospital time in the countries with low income in the patients of surgical PDA closure with device [14, 16]. Findings also showed that closure of PDA with the utilization of SHSMA occluder was not much expensive in comparison with the surgical closure of PDA.

CONCLUSION:

The method of trans-catheter PDA closure is much effectual and low invasive procedure in comparison with the surgical PDA ligation. The rate of complication of this procedure is very low and procedural expense is high in comparison with the surgical ligation of PDA closure.

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